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Yellow-Headed Spruce Sawfly

By Louis F. Wilson¹

The yellow-headed spruce sawfly (*Pikonema alaskensis* (Roh.)) is a destructive pest on several species of spruce in the United States and Canada. This native insect was described in 1911 by Rohwer from three adults collected in 1899 at Sitka, Alaska. The larvae were first reported from Massachusetts in 1916. Since then the range of the insect has been mapped from Maine and New Brunswick west through the Central Canadian Provinces and the Lake States to Wyoming and Idaho and north to British Columbia and Alaska.

This species is commonly found on planted and open-growing trees, while most natural and closed stands are typically free from attack. Shelterbelts, windbreaks, shade trees and ornamentals, nursery stock, young plantations, and naturally regenerated cutover areas may be damaged considerably by the larvae.

Hosts and Injury

The larvae limit their attack to various species of spruce (fig. 1). They have been collected on white spruce (*Picea glauca* (Moench) Voss), black spruce (*P. mariana* (Mill.) B. S. P.), blue spruce (*P. pungens* Engelm.), red spruce (*P. rubens* Sarg.), Norway spruce (*P. abies* (L.) Karst.), and Engelmann spruce (*P. engelmannii* Parry).

Heavily infested trees appear ragged early in the season from the



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FIGURE 1.—Entomologist examining a white spruce branch defoliated by the yellow-headed spruce sawfly. The tree is in a Minnesota roadside planting.

brown needle stubs on the new growth. Later on, as the larvae move onto the old foliage, the entire tree may be defoliated. When this occurs recovery is seldom possible. Young plantation trees usually are not susceptible to attack until the third to fifth year after planting. Trees older than this are susceptible at all times, and 3 or 4 consecutive years of moderate to heavy defoliation will kill up to 90 percent of an open stand. On trees that do not die, there is some branch killing and considerable increment reduction.

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Description

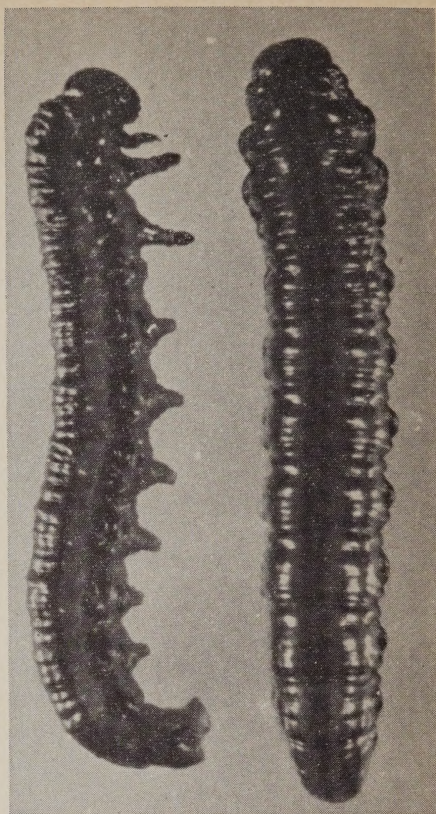
The newly laid egg is pearly white to pale green with a thin, transparent, and finely stippled shell. Its average size is 1.3 mm. long by 0.7 mm. wide. As the egg becomes older, black eyespots of the embryo can be seen through the shell.

The newly hatched larva is about $\frac{1}{8}$ inch long with a yellow head that soon becomes orange yellow after feeding. The body is a light yellow green with no markings. When fully grown the larva is about $\frac{3}{4}$ inch long and has a chestnut-brown or reddish-yellow head that may be mottled with various shades of brown. The body has a waxy or glossy appearance and is olive green above and lighter green beneath. Each side of the body is marked with stripes—a gray-green, longitudinal stripe just lateral to the midline of the back, a broad one beneath this, a darker one further down, and a dark linear spot just above the leg bases (fig. 2).

The prepupa is identical in appearance to the mature larva, but becomes contracted after spinning the cocoon. The pupa at first is a light cream color. As it ages it becomes darker.

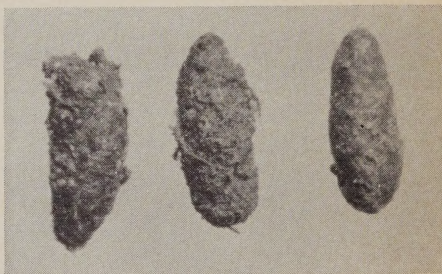
The cocoon is a tough, dark brown, somewhat fibrous structure with soil particles adhering to its surface (fig. 3). Some cocoons may be slightly curved. The cocoon of the male pupa averages about $\frac{2}{5}$ to $\frac{1}{2}$ inch long; that of the female is a little longer. One end is slightly larger and blunter than the other. Normally, a cocoon from which the adult has emerged has a circular hole at the larger end.

The adults are about $\frac{3}{8}$ inch long, with the abdomen varying from straw yellow to chestnut brown to nearly black. The thorax and head, like the abdomen, may be light or dark. The legs are the lighter shades, with the ends of the hind legs dark. The insect is flylike in



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FIGURE 2.—Side and top views of fully grown larvae of the yellow-headed spruce sawfly ($\times 5$).



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FIGURE 3.—Cocoons of the yellow-headed spruce sawfly ($\times 2$).

general appearance, but has four shiny, transparent wings.

Life History and Habits

Adults emerge from late May to mid-June at about the same time the scales fall from the spruce buds.

Eggs are deposited in shallow slits in the current season's needles, usually at the base but sometimes higher up. Occasionally, they may be laid in the tender bark of the stem between the needles. The eggs are well exposed. Usually there is one per needle, but as many as three have been found.

Larvae hatch in 5 to 10 days and feed for 30 to 40 days on the foliage. Small areas of the new needles are eaten first, then the entire needles; and finally when the larvae are half grown they move onto and devour the old foliage. If complete defoliation occurs, the larvae may then feed on the tender cortical tissues of the new growth. While feeding on the needles their posterior ends curve downward or upward. Disturbed larvae exude a liquid from their mouths and arch both ends in a characteristic manner. During July the full-grown larvae become prepupae, drop to the ground, enter the duff or topsoil, and spin their cocoons. They overwinter as prepupae in the cocoons and pupate in spring after the advent of warm weather. The pupal period lasts about 6 days. There is only one generation per year.

Biotic Control

Several species of hymenopterous and dipterous parasites have been recovered from specimens of this sawfly reared in the United States and Canada. The small wasplike insect *Trichogramma minutum* Riley is an occasional parasite of the sawfly eggs. Parasitized eggs are recognized by their jet-black color. At least 10 wasplike and 5 fly species parasitize the larvae sometime during their development.

Since the cocoons are located in the duff or soil, it is supposed that a certain amount of rodent predation occurs. Mice, voles, shrews, and other small mammals are known to feed on cocoons of several other sawfly species.

Parasites and predators rarely, if ever, hold populations of this sawfly in check when other environmental factors such as weather are favorable for buildup of the sawfly population.

Applied Control

Larvae of the yellow-headed spruce sawfly can be controlled easily on one or a few young trees by hand picking. When control is needed on tall trees or a large group of trees, insecticides are the most practical recourse. A hand or pack sprayer may be used for single trees or small groups of trees such as those found in ornamental plantings. Power sprayers, mounted on some type of vehicle, can be used on roadside plantations and very tall trees. Large plantations and natural stands are treated best by aircraft.

With DDT, a very effective contact and stomach poison, the following formulations are recommended. If a hand or pack sprayer is used, spray the trees thoroughly with a mixture of one part DDT (25-percent emulsible concentrate) to nine parts of water. For power sprayers, use 1 part DDT (25-percent emulsible concentrate) to 99 parts of water; apply this at the rate of 100 gallons per acre. Do not use formulations that require oil solvents with hand, pack, and power sprayers, since the oil may injure the spruce foliage. When stands are sprayed by aircraft, a DDT-in-oil solution may be safely used at the rate of 1 pound DDT (technical grade) per gallon of finished mixture per acre.

Benzene hexachloride (BHC) also may be sprayed from the ground. The formulation contains $\frac{2}{3}$ of an ounce of the gamma isomer of BHC in 40 gallons of water.

The insecticide should be applied in early or mid-June to kill the

larvae before they cause extensive damage. Date of application will depend on the season. A second application can be made about 3 weeks later if larvae are still present.

Caution: DDT and BHC are poisonous. Store them in plainly labeled containers away from all food. Follow directions and heed precautions given by the manufacturer. In forest spraying, avoid overdosing, especially over streams, ponds, and lakes.

References

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